

Application No. 10/717,295

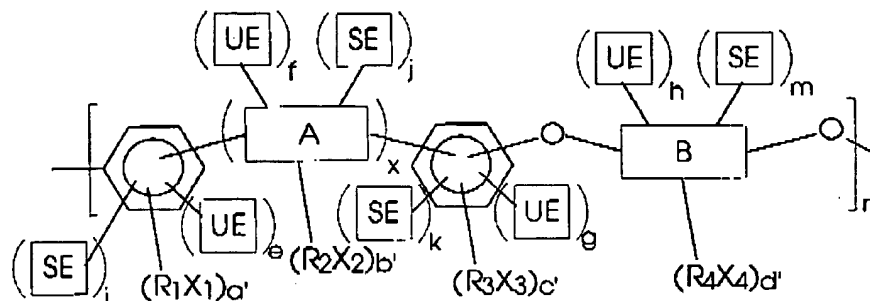
AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings of claims in the application:

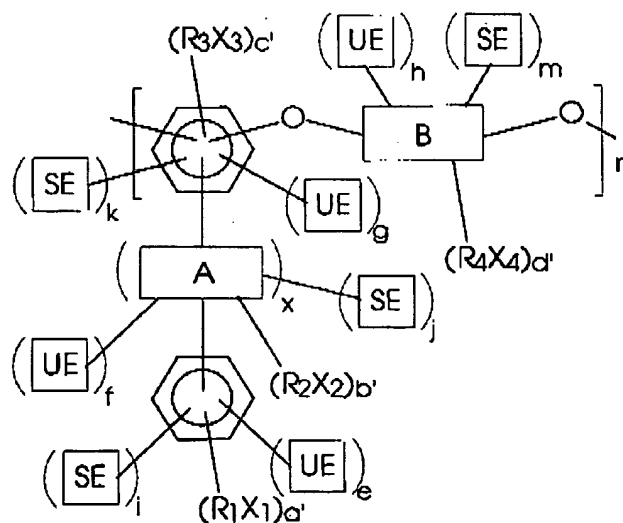
LISTING OF CLAIMS:

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1. (Original) A polymer of the formula



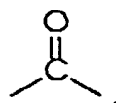
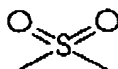
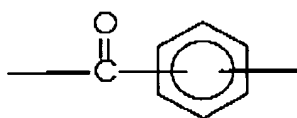
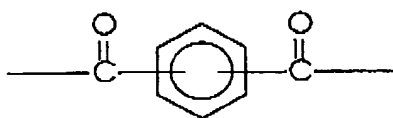
or



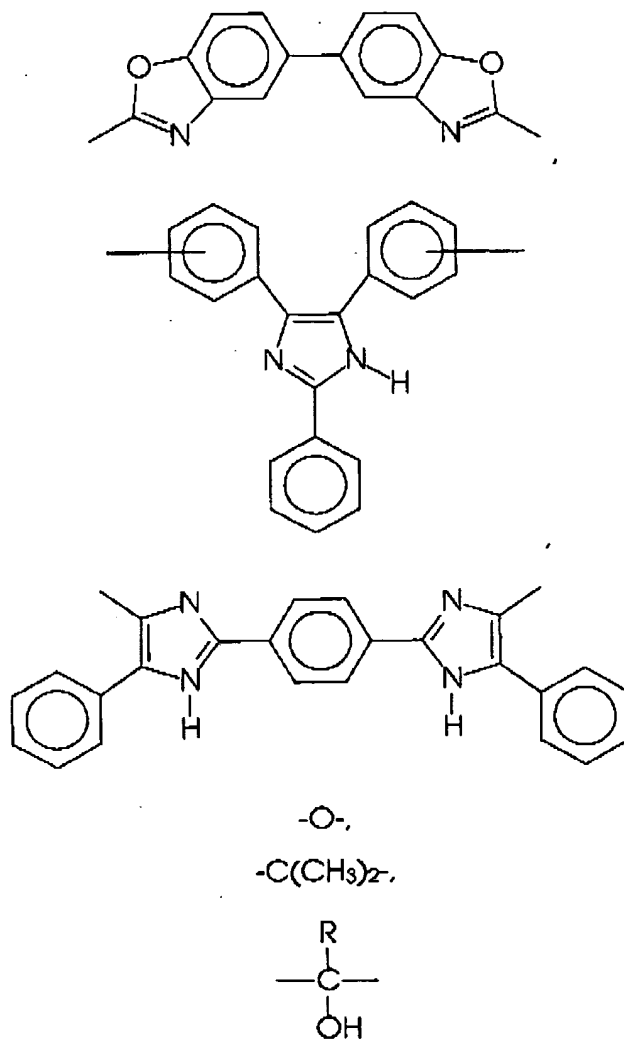
wherein x is an integer of 0 or 1, n is an integer representing the number of repeating monomer units, each of R_1 , R_2 , R_3 , and R_4 , independently of the others, is an alkyl group, an aryl group, an arylalkyl group, or an alkylaryl group, each of X_1 , X_2 , X_3 , and X_4 , independently of the others, is a halogen atom, a' , b' , c' , and d' are each, independently of the others,

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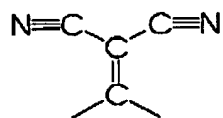
integers of 0, 1, 2, 3, or 4, each UE group, independently of the others, is an unsaturated ester group, e, f, g, and h are each, independently of the others, integers of 0, 1, 2, 3, or 4, provided that at least one of e, f, g, and h is equal to or greater than 1 in at least some of the monomer repeat units of the polymer, each SE group, independently of the others, is a saturated ester group, and i, j, k, and m are each, independently of the others, integers of 0, 1, 2, 3, or 4, provided that at least one of i, j, k, and m is equal to or greater than 1 in at least some of the monomer repeat units of the polymer, provided that the sum of $a'+e+i$ is less than or equal to 4, provided that the sum of $b'+f+j$ is less than or equal to 4, provided that the sum of $c'+g+k$ is less than or equal to 4, and provided that the sum of $d'+h+m$ is less than or equal to 4, A is



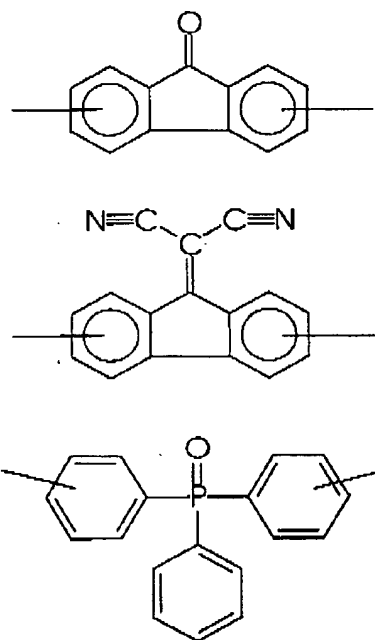
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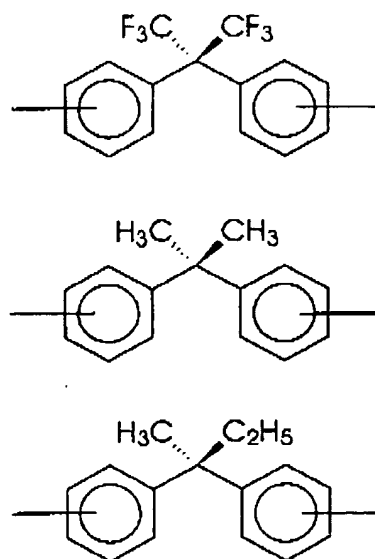
wherein R is a hydrogen atom, an alkyl group, an aryl group, an arylalkyl group, an alkylaryl group, or mixtures thereof.



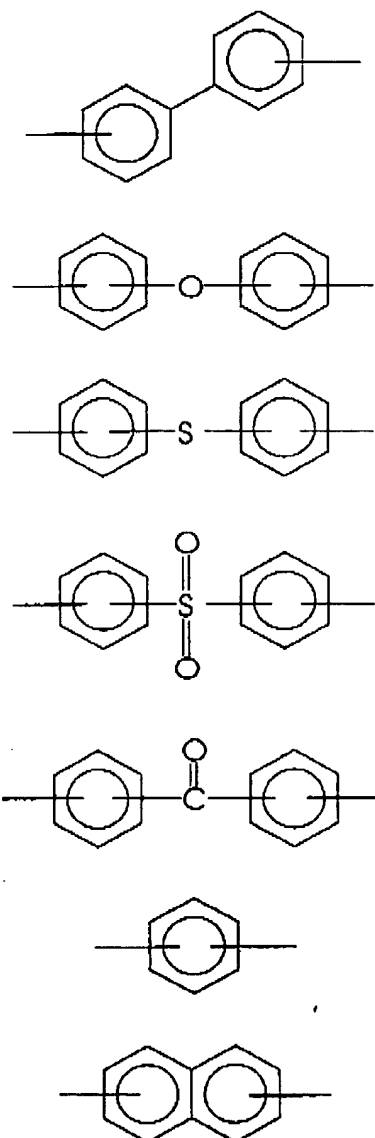
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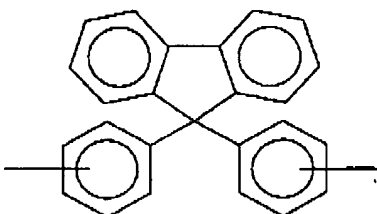
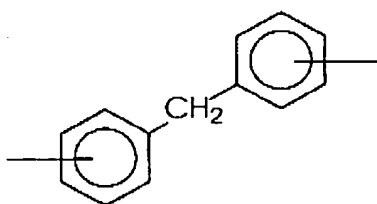
or mixtures thereof, B is



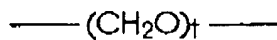
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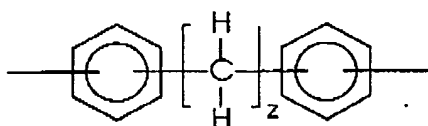
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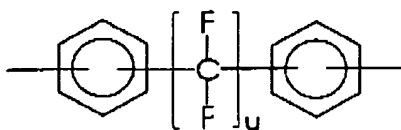
wherein v is an integer of from 1 to about 20,



wherein t is an integer of from 1 to about 20,

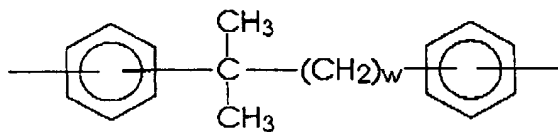
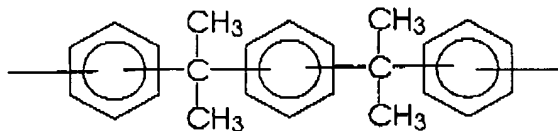
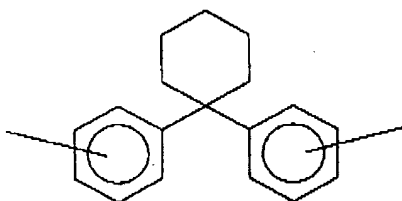
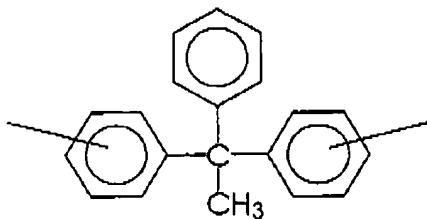


wherein z is an integer of from 2 to about 20,

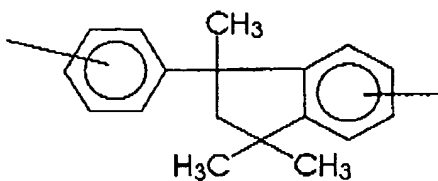


wherein u is an integer of from 1 to about 20,

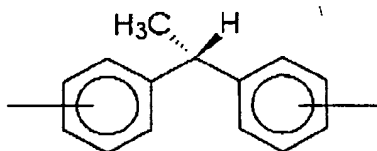
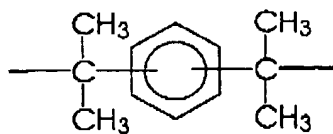
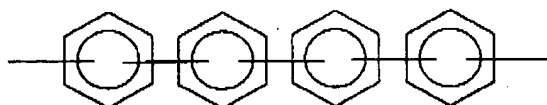
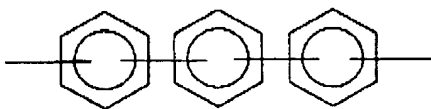
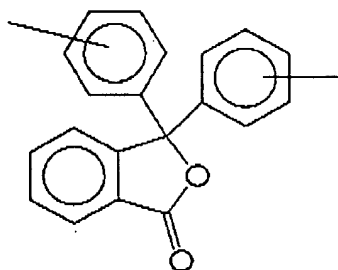
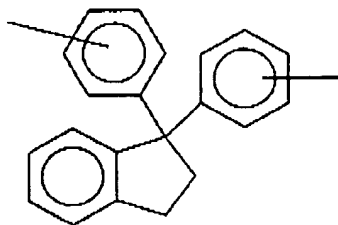
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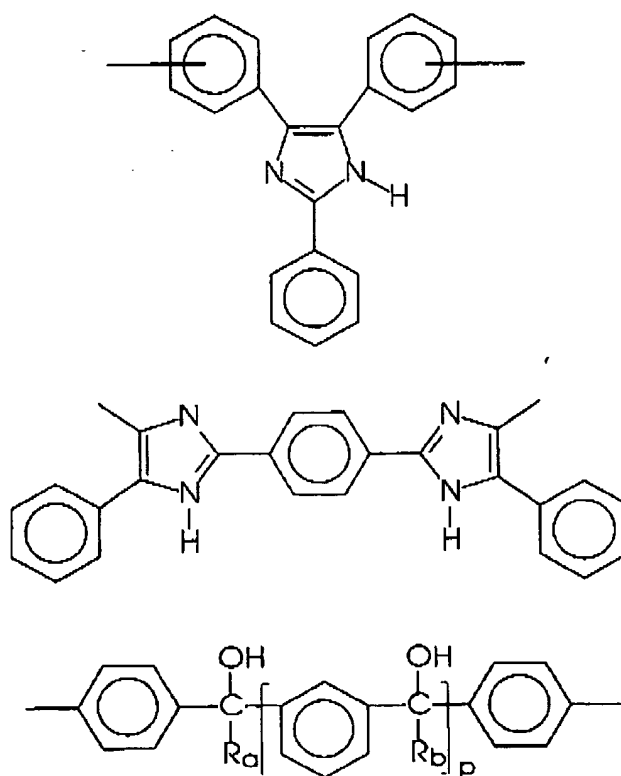
wherein w is an integer of from 1 to about 20.



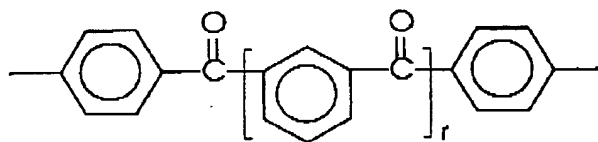
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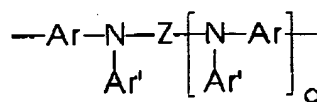
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wherein R_a and R_b each, independently of the other, are hydrogen atoms, alkyl groups, aryl groups, arylalkyl groups, alkylaryl groups, or mixtures thereof, and p is an integer of 0 or 1,

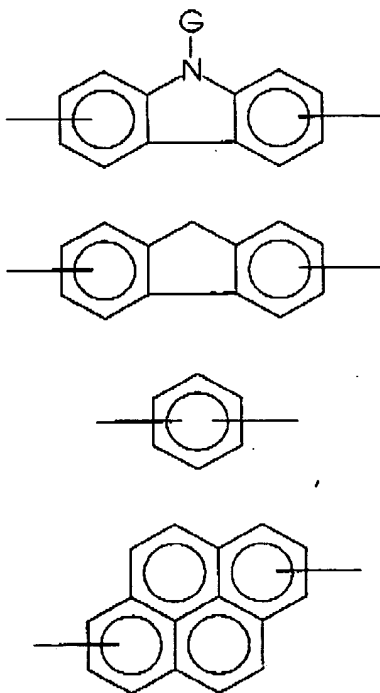


wherein r is an integer of 0 or 1,



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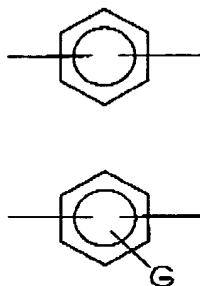
wherein (1) Z is



or

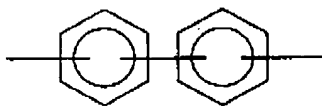


wherein y is 0 or 1; (2) Ar is

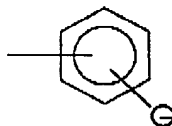
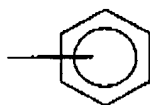


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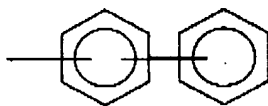
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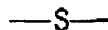
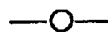
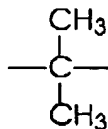
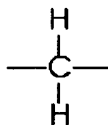
(3) G is an alkyl group selected from alkyl or isoalkyl groups containing from about 2 to about 10 carbon atoms; (4) Ar' is



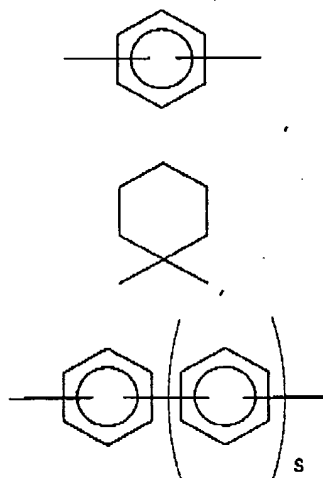
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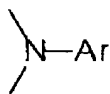
(5) X is



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wherein s is 0, 1, or 2,



or



and (6) q is 0 or 1; or mixtures thereof, wherein RX represents the total number of haloalkyl groups in the polymer and is the sum of all R_1X_1 groups + all R_2X_2 groups + all R_3X_3 groups + all R_4X_4 groups, and wherein the ratio of unsaturated ester groups to saturated ester groups to RX groups in the polymer is represented by

$$u\epsilon : \sigma\epsilon : p\chi$$

wherein $u\epsilon$ is from about 1 to about 99.99, wherein $\sigma\epsilon$ is from about 0.01 to about 99, wherein $p\chi$ is from 0 to about 50, and wherein $u\epsilon + \sigma\epsilon + p\chi = 100$.

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2. (Original) A polymer according to claim 1 wherein at least one of R_1 , R_2 , R_3 , and R_4 is a substituted alkyl group, a substituted aryl group, a substituted arylalkyl group, or a substituted alkylaryl group.

3. (Original) A polymer according to claim 1 wherein at least one of R_1 , R_2 , R_3 , and R_4 is an unsubstituted alkyl group, an unsubstituted aryl group, an unsubstituted arylalkyl group, or an unsubstituted alkylaryl group.

4. (Original) A polymer according to claim 1 wherein at least one of R_1 , R_2 , R_3 , and R_4 is an alkyl group having one or more hetero atoms therein, an aryl group having one or more hetero atoms therein, an arylalkyl group having one or more hetero atoms therein, or an alkylaryl group having one or more hetero atoms therein.

5. (Original) A polymer according to claim 4 wherein the hetero atoms are oxygen, nitrogen, sulfur, silicon, phosphorus, or a mixture thereof.

6. (Original) A polymer according to claim 1 wherein at least one of R_1 , R_2 , R_3 , and R_4 is an alkyl group having no hetero atoms therein, an aryl group having no hetero atom therein, an arylalkyl group having no hetero atoms therein, or an alkylaryl group having no hetero atoms therein.

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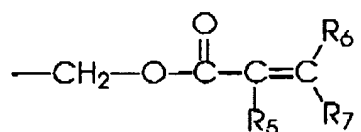
7. (Original) A polymer according to claim 1 wherein R_1 , R_2 , R_3 , and R_4 are all alkyl groups.

8. (Original) A polymer according to claim 1 wherein R_1 , R_2 , R_3 , and R_4 are all methyl groups.

9. (Original) A polymer according to claim 1 wherein X_1 , X_2 , X_3 , and X_4 each, independently of the others, are fluorine atoms, chlorine atoms, bromine atoms, or iodine atoms.

10. (Original) A polymer according to claim 1 wherein X_1 , X_2 , X_3 , and X_4 are each chlorine atoms.

11. (Original) A polymer according to claim 1 wherein the UE groups are of the formula



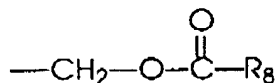
wherein R_5 , R_6 , and R_7 each, independently of the others, is a hydrogen atom, an alkyl group, an aryl group, an arylalkyl group, an alkylaryl group, or a mixture thereof.

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12. (Original) A polymer according to claim 1 wherein the UE groups are acrylic acid ester groups, methacrylic acid ester groups, cinnamic acid ester groups, crotonic acid ester groups, ethacrylic acid ester groups, oleic acid ester groups, linoleic acid ester groups, maleic acid ester groups, fumaric acid ester groups, itaconic acid ester groups, citraconic acid ester groups, phenylmaleic acid ester groups, 3-hexene-1,6-dicarboxylic acid ester groups, or mixtures thereof.

13. (Original) A polymer according to claim 1 wherein the UE groups are acrylic acid ester groups.

14. (Original) A polymer according to claim 1 wherein the SE groups are of the formula



wherein R₈ is a hydrogen atom, a saturated alkyl group, an aryl group, an arylalkyl group wherein the alkyl portion thereof is saturated, an alkylaryl group wherein the alkyl portion thereof is saturated, or a mixture thereof.

15. (Original) A polymer according to claim 1 wherein the SE groups are esters of acetic acid, esters of propionic acid, esters of butanoic acid, esters of cyclohexanoic acid, esters of polyhydrogenated naphthalene carboxylic acid, or mixtures thereof.

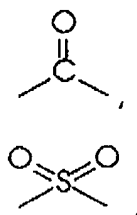
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16. (Original) A polymer according to claim 1 wherein the SE groups are esters of acetic acid.

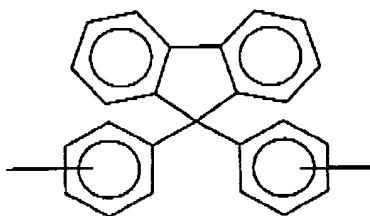
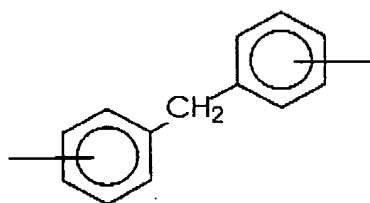
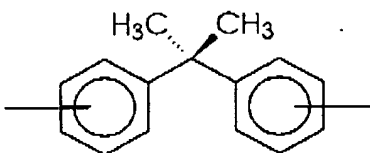
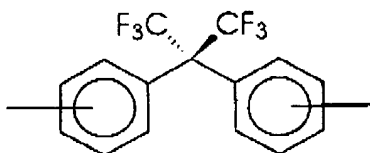
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17. (Original) A polymer according to claim 1 wherein

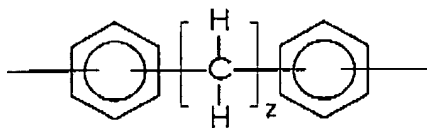
A is



or a mixture thereof and B is



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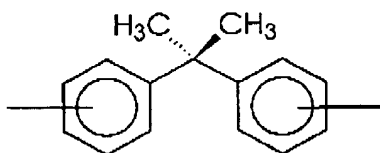
wherein z is an integer of from 2 to about 20, or a mixture thereof.

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18. (Original) A polymer according to claim 1 wherein
A is



and B is



19. (Original) A polymer according to claim 1 wherein
at least about 0.5 out of every 1 monomer repeat unit has thereon an RX
group, a UE group, or a SE group.

20. (Original) A polymer according to claim 1 wherein
at least about 0.7 out of every 1 monomer repeat unit has thereon an RX
group, a UE group, or a SE group.

21. (Original) A polymer according to claim 1 wherein
no more than about 1.2 out of every 1 monomer repeat unit has thereon
an RX group, a UE group, or a SE group.

22. (Original) A polymer according to claim 1 wherein
no more than about 0.8 out of every 1 monomer repeat unit has thereon
an RX group, a UE group, or a SE group.

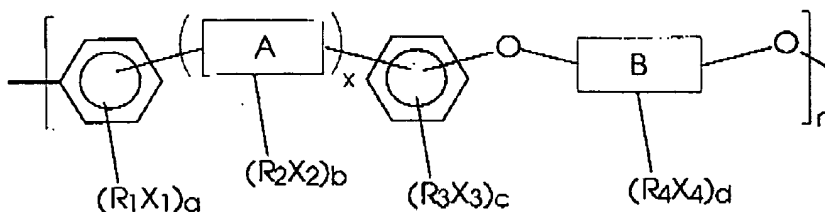
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23. (Original) A polymer according to claim 1 wherein p_x is no more than about 10.

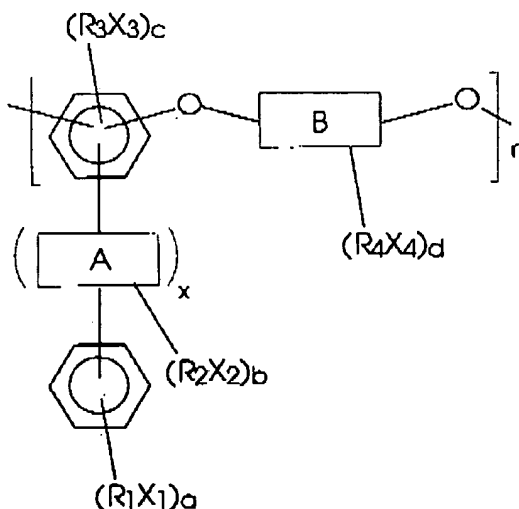
24. (Original) A polymer according to claim 1 wherein p_x is no more than about 5.

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25. (Original) A process for preparing a photosensitive polymer which comprises reacting a haloalkylated precursor polymer of the formula

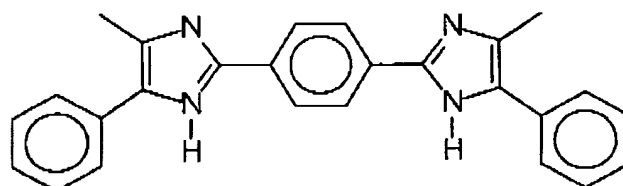
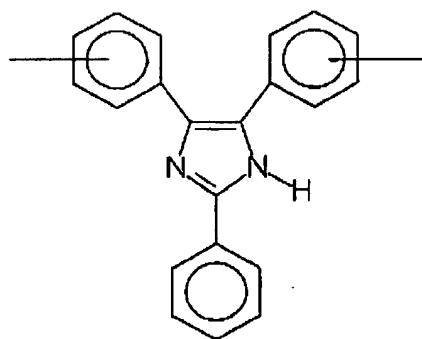
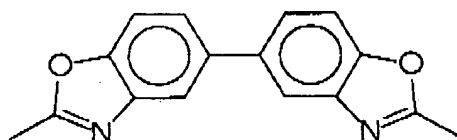
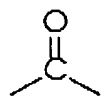
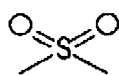
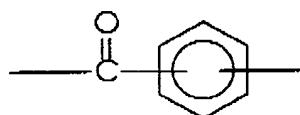
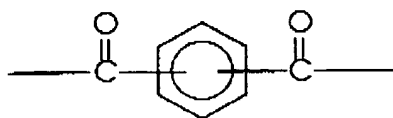


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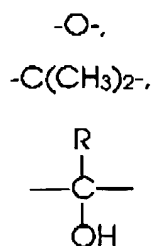


wherein x is an integer of 0 or 1, n is an integer representing the number of repeating monomer units, each of R_1 , R_2 , R_3 , and R_4 , independently of the others, is an alkyl group, an aryl group, an arylalkyl group, or an alkylaryl group, each of X_1 , X_2 , X_3 , and X_4 , independently of the others, is a halogen atom, a , b , c , and d are each integers of 0, 1, 2, 3, or 4, provided that at least one of a , b , c , and d is equal to or greater than 1 in at least some of the monomer repeat units of the polymer, A is

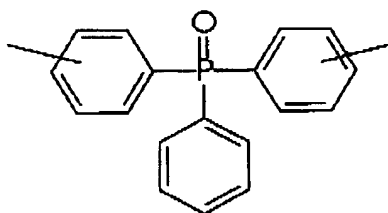
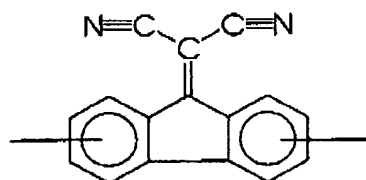
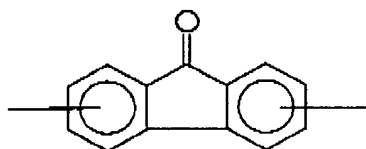
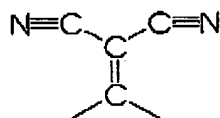
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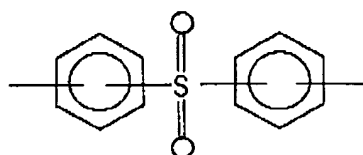
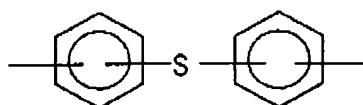
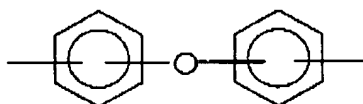
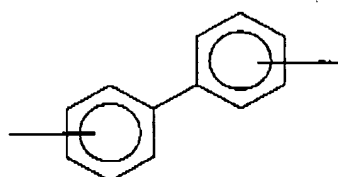
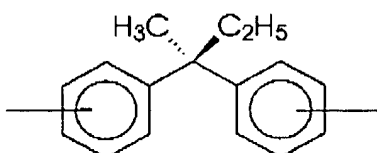
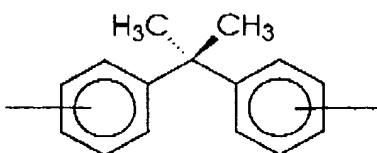
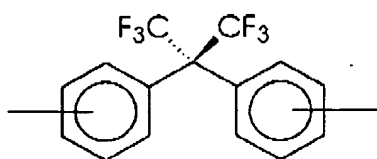


wherein R is a hydrogen atom, an alkyl group, an aryl group, an arylalkyl group, an alkylaryl group, or mixtures thereof,

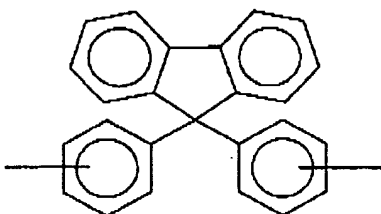
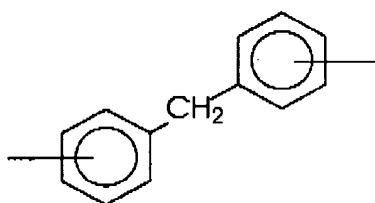
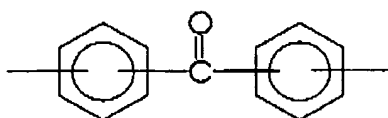


or mixtures thereof, B is

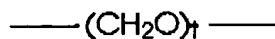
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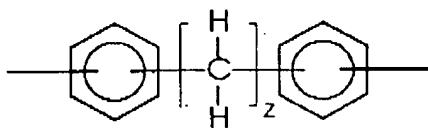


wherein v is an integer of from 1 to about 20,

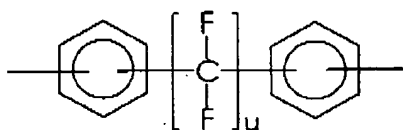


wherein t is an integer of from 1 to about 20,

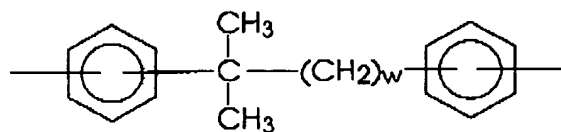
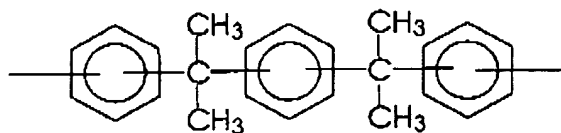
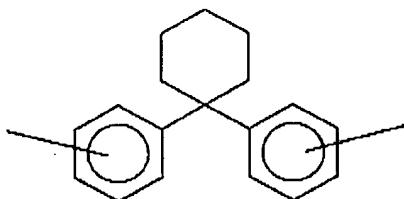
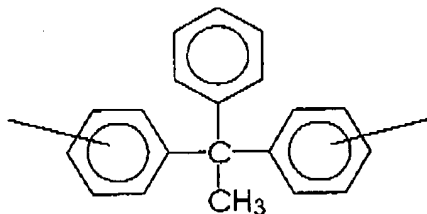
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wherein z is an integer of from 2 to about 20,

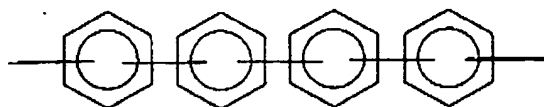
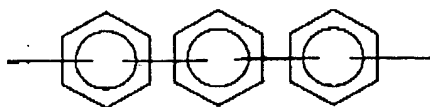
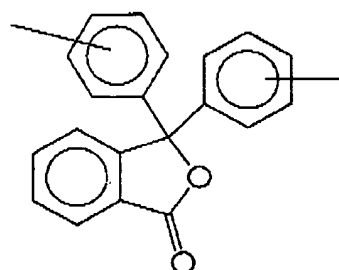
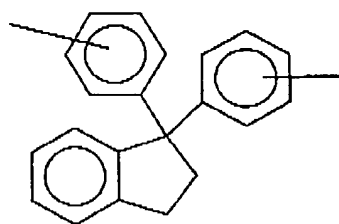
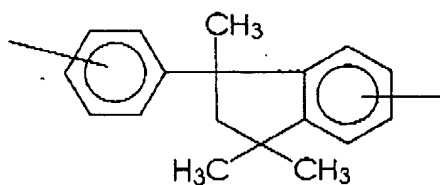


wherein u is an integer of from 1 to about 20,

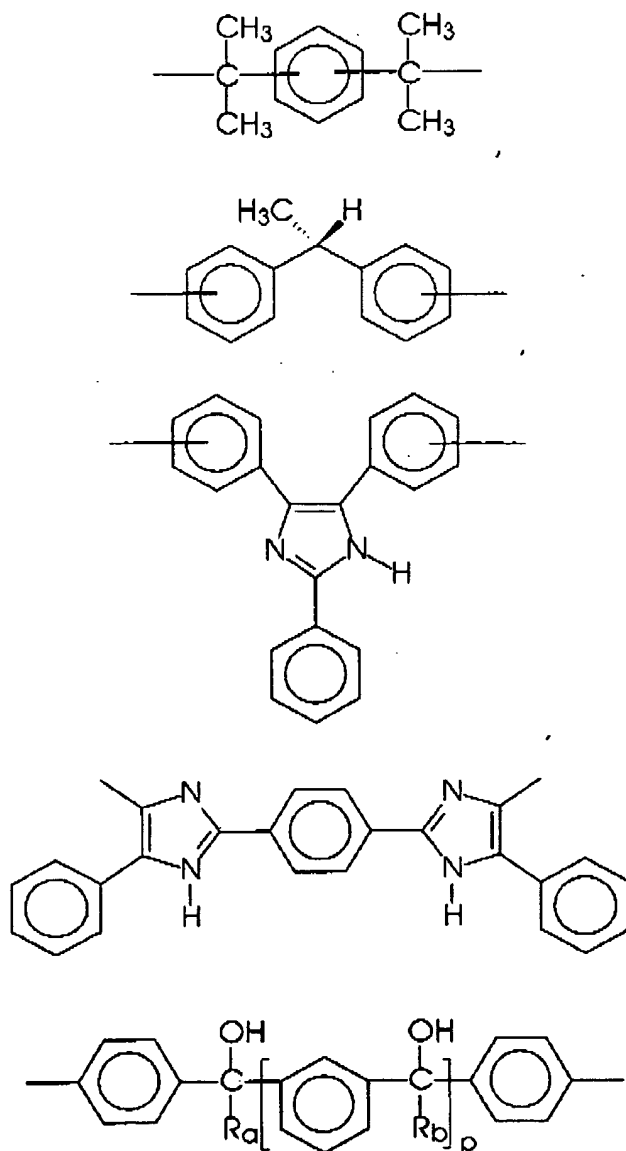


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wherein w is an integer of from 1 to about 20,

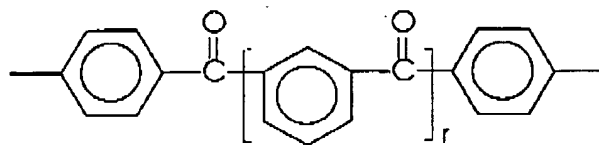


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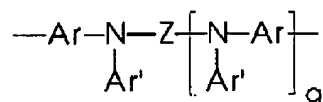


wherein R_a and R_b each, independently of the other, are hydrogen atoms, alkyl groups, aryl groups, arylalkyl groups, alkylaryl groups, or mixtures thereof, and p is an integer of 0 or 1,

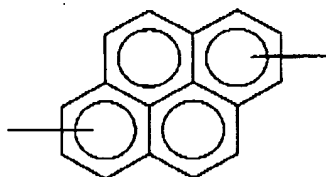
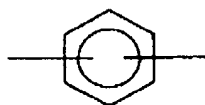
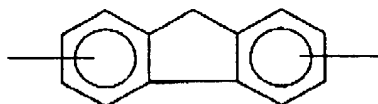
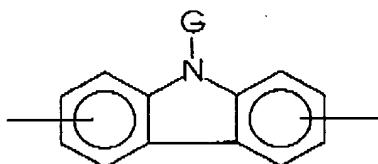
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wherein r is an integer of 0 or 1,



wherein (1) Z is

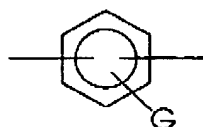


or

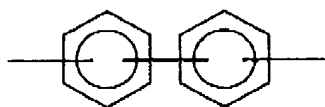


wherein y is 0 or 1; (2) Ar is

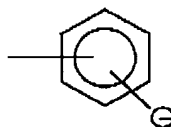
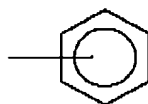
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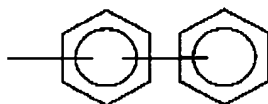
or



(3) G is an alkyl group selected from alkyl or isoalkyl groups containing from about 2 to about 10 carbon atoms; (4) Ar' is

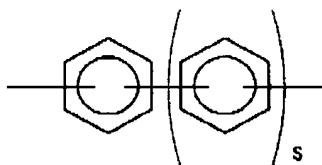
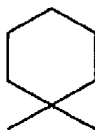
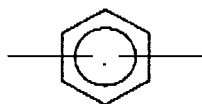
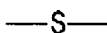
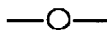
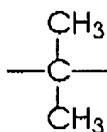
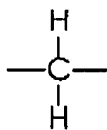


or

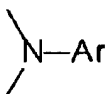


(5) X is

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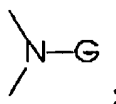


wherein s is 0, 1, or 2,

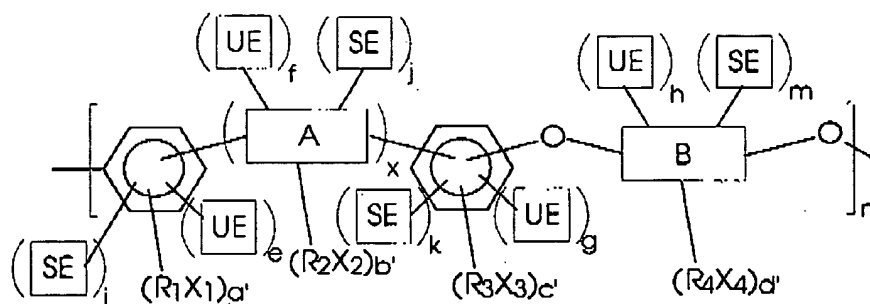


or

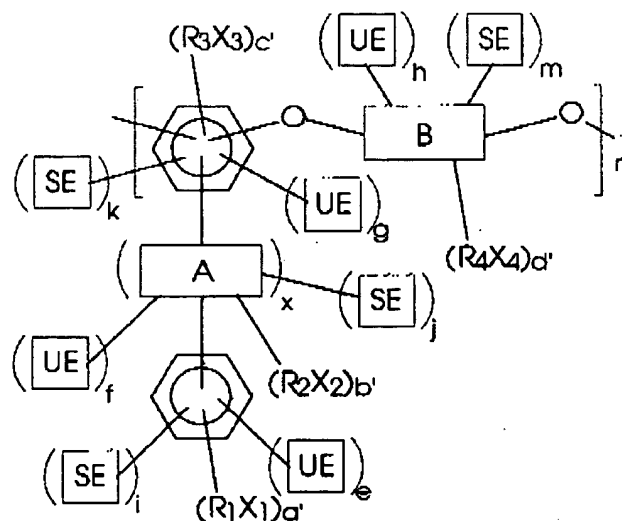
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and (6) q is 0 or 1; or mixtures thereof, with an unsaturated ester salt and a saturated ester salt, thereby forming a curable polymer of the formula



or



wherein a', b', c', and d' are each, independently of the others, integers of 0, 1, 2, 3, or 4, each UE group, independently of the others, is an

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unsaturated ester group corresponding to the unsaturated ester salt, e, f, g, and h are each, independently of the others, integers of 0, 1, 2, 3, or 4, provided that at least one of e, f, g, and h is equal to or greater than 1 in at least some of the monomer repeat units of the polymer, each SE group, independently of the others, is a saturated ester group corresponding to the saturated ester salt, and i, j, k, and m are each, independently of the others, integers of 0, 1, 2, 3, or 4, provided that at least one of i, j, k, and m is equal to or greater than 1 in at least some of the monomer repeat units of the polymer, provided that the sum of $a'+e+i$ is less than or equal to 4, provided that the sum of $b'+f+j$ is less than or equal to 4, provided that the sum of $c'+g+k$ is less than or equal to 4, and provided that the sum of $d'+h+m$ is less than or equal to 4, wherein RX represents the total number of haloalkyl groups in the polymer and is the sum of all R_1X_1 groups + all R_2X_2 groups + all R_3X_3 groups + all R_4X_4 groups, wherein the ratio of unsaturated ester salt to saturated ester salt is selected so that in the resulting polymer the ratio of unsaturated ester groups to saturated ester groups to RX groups in the polymer is represented by

$$ue:\sigma e:px$$

wherein ue is from about 1 to about 99.99, wherein σe is from about 0.01 to about 99, wherein px is from 0 to about 50, and wherein $ue+\sigma e+px=100$.

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26. (Original) A process according to claim 25 wherein the unsaturated ester salt and the saturated ester salt are added simultaneously to the precursor polymer.

27. (Original) A process according to claim 25 wherein the unsaturated ester salt and the saturated ester salt are added sequentially to the precursor polymer.

28. (Original) A process according to claim 27 wherein the unsaturated ester salt is added first and the saturated ester salt is added second.

29. (Original) A process according to claim 27 wherein the saturated ester salt is added first and the unsaturated ester salt is added second.

30. (Original) A process according to claim 25 wherein the reaction is carried out at a temperature of at least about 20°C.

31. (Original) A process according to claim 25 wherein the reaction is carried out at a temperature of no more than about 35°C.

32. (Original) A process according to claim 25 wherein the reaction is carried out for a period of at least about 30 minutes.

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33. (Original) A process according to claim 25 wherein the reaction is carried out for a period of at least about 2 hours.

34. (Original) A process according to claim 25 wherein the reaction is carried out for a period of no more than about 15 days.

35. (Original) A process according to claim 25 wherein the reaction is carried out for a period of no more than about 2 days.

36. (Original) A process according to claim 25 wherein the unsaturated ester is present in a molar excess amount.

37. (Original) A process according to claim 25 wherein p_x is no more than about 10.

38. (Original) A process according to claim 25 wherein p_x is no more than about 5.

39. (New) A polymer according to claim 1 wherein p_x is no more than about 2.

40. (New) A polymer according to claim 1 wherein p_x is no more than about 1.

41. (New) A polymer according to claim 1 wherein p_x is no more than about 0.1.

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42. (New) A polymer according to claim 1 wherein p_x is 0.

43. (New) A process according to claim 25 wherein p_x is no more than about 2.

44. (New) A process according to claim 25 wherein p_x is no more than about 1.

45. (New) A process according to claim 25 wherein p_x is no more than about 0.1.

46. (New) A process according to claim 25 wherein p_x is 0.